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The anatomy of the sacral promontory: how to avoid complications of the sacrocolpopexy procedure

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Disclosure statement:

Géraldine Giraudet participates to workshops sessions for Olympus, Boston Scientific and AMS

Michel Cosson participates to a clinical research for Coloplast, participates to workshops, expert meeting and teaching lessons for Fresenius, Allergan, Olympus and Boston Scientific, AMS, has two patents in the field of pelvic synthetic mesh and genital prolapse surgery

Aurore Protat has no conflict of interest

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This video shows the variations of the anatomical structures in front of the sacral promontory that surgeons have to know to avoid severe complications.

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Abstract:

Because of problems with vaginal meshes and high rate recurrences of native tissue repair, more and more surgeons treat pelvic organ prolapse performing laparoscopic sacrocolpopexy. This surgery requires skilled surgeons. The first step of sacrocolpopexy is the dissection of tissues in front of the sacral promontory to reach the anterior longitudinal ligament. Some complications can occur during this dissection and the attachment of the mesh. This place is dangerous for surgeons because of the proximity of vessels, nerves and ureters. The lack of knowledge of the anatomy can lead to severe complications such as vascular, ureteral or nerve injuries. These complications can be life threatening. In order to show the anatomical concerns when surgeons dissect and fix the mesh on the anterior longitudinal ligament, we have developed a video of the promontory anatomy. By reviewing anatomical articles about vessels, nerves and ureters in this localization, we propose an educational tool to increase the anatomical knowledge to avoid severe complications. In this video, we show an alternative location for dissection and graft fixation when the surgeon feels mesh cannot be safely fixed on the anterior surface of S1, as currently recommended.

Key words: sacral promontory, anatomy, ureter, superior hypogastric nerve, iliac vein, iliac artery

Problem:

Sacrocolpopexy is a surgical technique to treat pelvic organ prolapse of women with a low recurrence and complication rate. This procedure requires to be performed by laparoscopic trained surgeons. Because of problems with vaginal mesh surgery and recurrences after native tissue repair, more and more surgeons perform laparoscopic sacrocolpopexy. This procedure requires skilled surgeons. The learning curve is obtained after 30 procedures [1]. Dissection of the promontory to access the anterior longitudinal ligament (ALL) is at risk because of the proximity of nerves, vessels and right ureter. An injury can occur during dissection of the space leading to hemorrhage and life-threatening situation. Bowel symptoms, voiding and sexual dysfunctions have been described due to neural injury. It's very important to well know the anatomy of the promontory to avoid these problems. In the US, it has been shown that a lot of death out the 80000 described may be due to anatomical errors [2]. Vessels, nerves and right ureter are situated under the peritoneum in front of the promontory and are not always seen before to open it. Surgeons have to perfectly know the anatomy of the presacral space to avoid severe complications.

Our solutions:

We have developed a video to show the anatomical variations that can be encountered during dissection and fixation of the mesh on the ALL. We have studied anatomy to determine how close vessels, nerves and right ureter can be. If surgeon feels mesh cannot be safely fixed to the anterior longitudinal ligament on the anterior surface of S1 below the promontory, the best alternative region for mesh fixation is highlighted

in the Figure 1 and video. The anatomical sacral promontory is defined as the most superior surface on the body of the first sacral vertebrae. We describe the variations of the distance between the midsacral promontory (MSP) (defined here as the middle of the most prominent structure in the presacral space) and the vessels, right ureter and nerves. Hypogastric nerves are situated just under the peritoneum at the left of the middle line. Surgeons have to know it before to open the peritoneum not to injure it. Middle sacral vessels stay close to the midline. Right ureter is as close as 13 mm from the MSP and has to be seen during dissection (figure 2) [3]. Left common iliac vein is the most at risk structure of injury because it can be only at 9 mm from the middle line (figure 3) [4]. The localization of the right common iliac artery varies from 14 to 39 mm from the MSP (figure 4) [4]. Injury of these vessels can cause severe hemorrhage. When significant vascularity is encountered on anterior surface of S1, which is currently the recommended location for mesh fixation, surgeons should consider an alternative site for mesh attachment that is relatively safe [5]. We propose a best alternative region for mesh fixation when surgeon feels mesh cannot be safely fixed to the anterior longitudinal ligament on the anterior surface of S1 below the promontory, as currently recommended (figure 1). To avoid complications, surgeons have to dissect carefully and keep the right.

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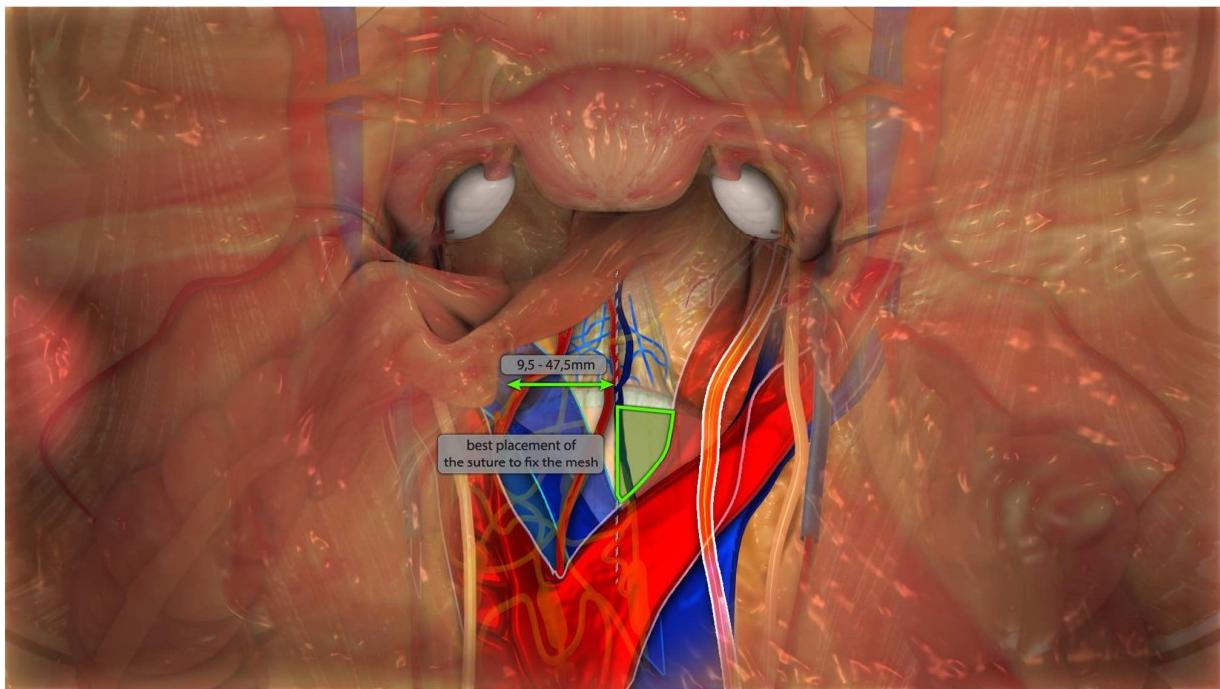
Figure 1: Best alternative mesh fixation site

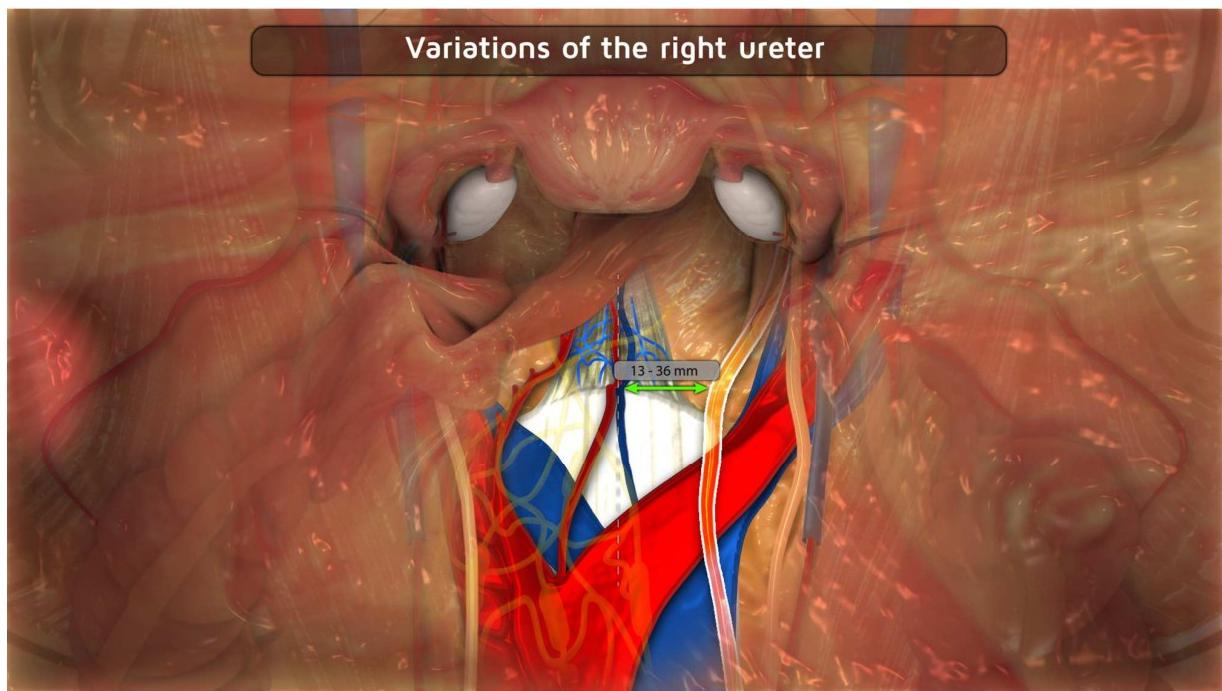
Figure 2: Anatomical variations of the right ureter

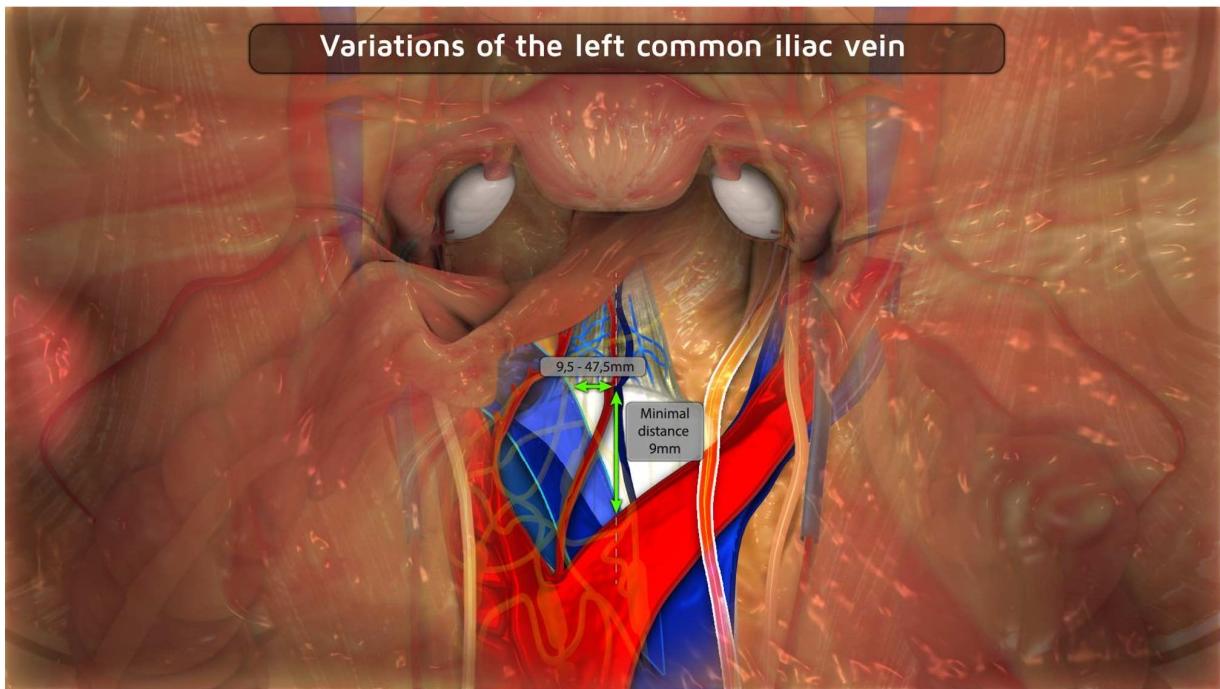
Figure 3: Anatomical variations of the left common iliac vein

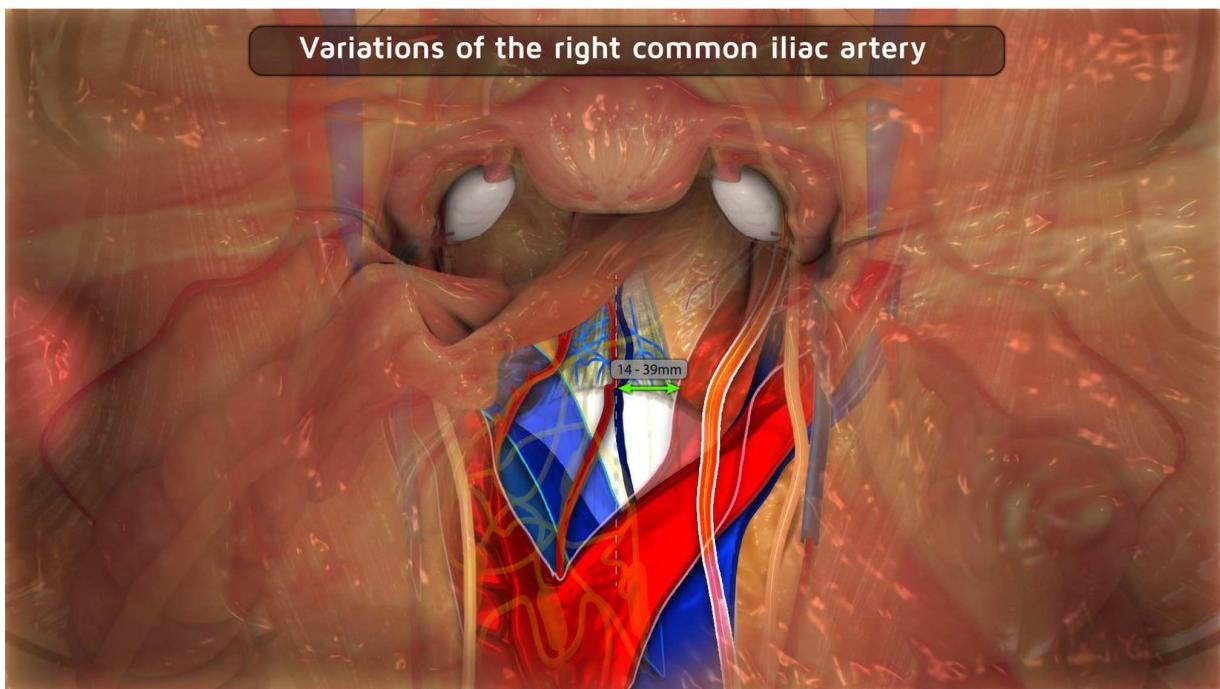
Figure 4: Anatomical variations of the right common iliac artery

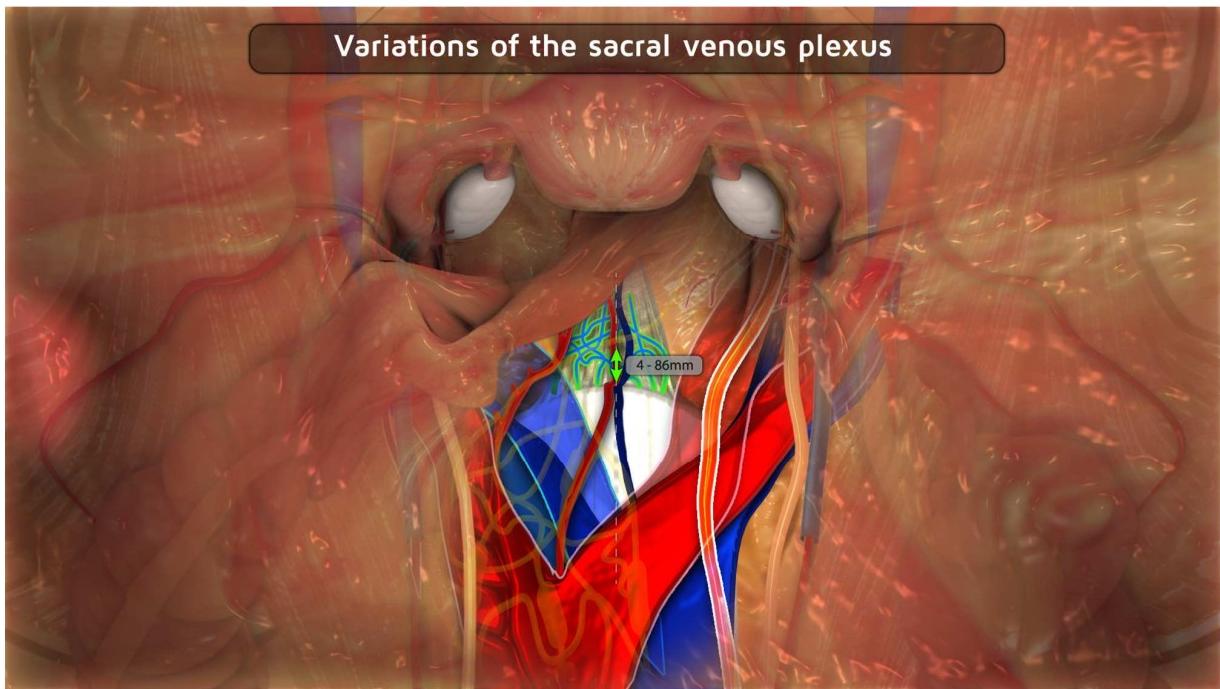
Figure 5: Anatomical variations of the sacral venous plexus











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